



# ADMINISTRATIVE NOTES

Newsletter of the Federal Depository Library Program

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Dear Documents Librarian:

This is an historic event for the Depository Library Program. With this letter, I am issuing you a copy of a Compact Disc - Read Only Memory (CD-ROM) entitled "Test Disc No. 2," recently published by the Bureau of the Census.

Federal agencies are quickly embracing this new technology because of its amazing capacity (the equivalent of 275,000 pages on a single disc) and relatively low cost. The Government Printing Office is supporting agencies' efforts by acquiring equipment, software, and expertise to fulfill their CD-ROM publishing needs.

GPO is also committed to providing copies of suitable CD-ROMs produced or procured through GPO by other agencies to Federal depository libraries. This may require some effort by all of us -- agency publishers, GPO, depository libraries, and information users -- to adapt to this new medium and sort out the complex issues that often accompany technological progress.

This special issue of Administrative Notes contains information to help you begin to assimilate CD-ROM products into the depository collection. I'd especially like to call your attention to the list of depository resource centers that begins on page 28. These libraries, which constitute the test group that received the Test Disc No. 2 last September, have graciously agreed to share their experience in using the CD-ROM with other depositories. It is this cooperative spirit that will help all of us meet the challenges of the future.

Sincerely,

DONALD E. FOSSEDAL  
Superintendent of Documents

## What You'll Need To Use CD-ROM:

### Equipment

Depository libraries are responsible for providing their own equipment for using Compact Disc - Read Only Memory (CD-ROM) products received on deposit. The two basic pieces of equipment needed to use CD-ROMs are a microcomputer and a CD-ROM drive. A printer may also be useful for printing search results, but it is not essential. The brand of equipment that you choose is entirely up to you.

Despite the relative newness of CD-ROM as a publishing medium, equipment compatibility is not a major issue. Virtually all CD-ROM drives and discs are manufactured to universally accepted standards (known as the Philips/Sony Yellow Book and High Sierra or ISO 9660). As a result, most discs can be used interchangeably on a wide variety of equipment. A note of caution is in order, however -- not all software runs on every computer. For example, Apple Computer recently began selling a CD-ROM drive for Mackintosh and Apple II computers. In theory, this equipment can read any CD-ROM produced in High Sierra or ISO 9660 format. However, in many instances, the search software is written for IBM-compatible PCs and will not run on Apple computers. Some experts predict that in the future most discs will contain software in both formats, but that practice is not yet common.

Census Test Disc Number 2 was produced in High Sierra format and the software runs under MS-DOS, thus making it suitable for use with most IBM-compatible microcomputers and CD-ROM drives on the market. If you already have or plan to purchase a microcomputer other than an IBM-compatible, check with the manufacturer or distributor to ensure that it can run MS-DOS based software and is compatible with one or more CD-ROM drives on the market.

Microcomputers should be equipped with at least 640K random access memory (RAM) in order to use Test Disc No. 2. You will have to decide, based on how you plan to use the computer, what kinds of drives, e.g., floppy disks and/or hard disk, you need. Software for Test Disc No. 2 is provided on 5.25 inch, double density (360K) floppy disks. Most newer computers are configured with a hard disk, but strictly speaking, a hard disk is not necessary for using CD-ROMs. (Many users choose to install CD-ROM search software on their hard disk for greater speed and flexibility.)

CD-ROM drives range in price from about \$600 to \$1,200. More detailed information about prices, compatibility, and other concerns can be obtained by contacting hardware vendors directly. (See page 22 for an article about CD-ROM drives that appeared in CD-ROM Review, v. 2, no. 4. Although this article is somewhat dated, it provides telephone numbers and addresses for most drive manufacturers.)



## Software

Software for performing simple data retrieval from Test Disc No. 2 was developed by the Census Bureau and provided to you on the floppy disk contained in this package. These programs were designed to search the disc in response to requests entered via keyboard and display the search results. The software is in the public domain and therefore may be copied. However, it was written especially for retrieving data from Test Disc No. 2 and will not work with other CD-ROM products, including Census Test Disc No. 1.

In addition to the floppy disk containing search software, you will need MS-DOS 3.1 or higher as your operating system software. (MS-DOS may be called a slightly different name, for example, IBM calls their version PC-DOS.) Earlier versions of MS-DOS will not suffice because they do not have the same network capability as later versions.

Finally, you will need DOS file manager software, such as Microsoft's CD-ROM Extensions. CD-ROM Extensions is a collection of programs that enables the microcomputer to communicate with the attached CD-ROM drive(s). One (or more) of the programs is a hardware-dependent "device driver" designed to work with a particular brand of CD-ROM drive. Any version of CD-ROM Extensions can be used to operate Test Disc No. 2, however, **future CD-ROMs from the Census Bureau will require version 2.0 or higher.** (For a more detailed description of CD-ROM Extensions, see page 11.)

If you are ordering a new CD-ROM drive, you will probably receive a copy of CD-ROM Extensions with it. Nevertheless, **it is strongly recommended that you ask for a copy of CD-ROM Extensions when you place your order.**

If you already have a CD-ROM drive, you may not know whether it is equipped with file manager software like CD-ROM Extensions. To find out, try signing on to your CD-ROM drive just as though it is a magnetic disk drive, and perform simple file management tasks, like listing the directory. (For example, from the DOS prompt, type the command DIR and the letter used to designate the CD-ROM drive followed by a colon [e.g., C> DIR L:] and press enter.) If you get an error message, it may mean that you need to obtain and install CD-ROM Extensions.

A number of companies have been licensed by Microsoft Corporation to sell CD-ROM Extensions directly to customers who already own CD-ROM drives. There are several variations of CD-ROM Extensions, each designed to support a different brand of CD-ROM drive. You may need to supply the brand name and model number of your CD-ROM drive when you order. Prices for CD-ROM Extensions range from \$25.00 plus shipping to \$50.00, and delivery may take from two days to two weeks. Some companies require payment in advance rather than invoicing customers. For a list of distributors and the drives they support, see p. 16.

Software for performing simple data retrieval has been developed by the Census Bureau and provided to you on the enclosed floppy disk. Recognizing that some users may want to perform complex queries or manipulate data in other ways, Census Bureau structured the files on Test Disc No. 2 in dBase III format. dBase III is a popular database management software package developed by Ashton-Tate and available from a number of private suppliers. Several other

database management systems are also able to use the dBase III file format. (For more information about the file format, see CD-ROM Test Disc No. 2 Technical Documentation published by the Census Bureau.)

## How To Get Started Using Test Disc No. 2:

CD-ROM Extensions must be installed on your computer before you will be able to use Test Disc No. 2. Follow the instructions that accompany the software carefully when installing CD-ROM Extensions on your computer. During the installation process, a letter will be assigned to the CD-ROM drive.

Information storage devices attached to microcomputers are usually identified by a letter. For example, the hard disk on most microcomputers is called drive C:. No letter designation has been universally accepted yet for CD-ROM drives. Many CD-ROM publishers supply setup programs with their products that examine the hardware configuration and automatically designate the next available letter as the CD-ROM drive. Others require you to use a particular letter, such E: or L:, to identify the CD-ROM drive.

The software provided by the Census Bureau is designed to look for a CD-ROM drive called drive L:. It can be changed very easily if your system is already configured to use a different letter for the CD-ROM drive. To find out what letter was assigned to your CD-ROM drive when the system was configured, check your autoexec.bat file. (To list the file, enter **type autoexec.bat** from the DOS prompt in the root directory.) If the line that references the Extensions program MSCDEX.EXE contains L:[letter], the CD-ROM drive is assigned the letter following the colon (e.g., L:E means the CD-ROM drive has been designated as drive E). If there is no L:, the CD-ROM drive defaults to the first unused letter in your configuration. In systems containing a hard disk, that letter is frequently D.

It doesn't matter which letter of the alphabet your system uses. What is important is that your system files (config.sys and autoexec.bat) and the Census software use the same letter to identify the CD-ROM drive. In order to modify the Census software to run on a CD-ROM drive other than drive L:, type "CDREADER" (no quotes) and follow the instructions on the screen. (Don't forget to remove the write protect tab from the floppy disk, if necessary.)

The floppy disk contains a reading file that describes how to use the command-driven software for searching for data on the CD-ROM. To display the reading file on your screen, sign on to the drive containing Census software and type "README" (no quotes).

It is recommended that you create a backup copy of the floppy disk containing the software. You should use the backup copy, and put the original disk from the Census Bureau away for safekeeping.

## Trouble-Shooting Guide for Installing Test Disc No. 2:

The following is a synopsis of the most common errors that test libraries encountered using Test Disc No. 2. Before resorting to this guide, however, make sure that CD-ROM Extensions has been properly installed. One quick way to check this is to execute a DIR command on the designated CD-ROM drive (e.g., type "DIR L:" [no quotes] and press enter. Note that the parameter "L:" in the command corresponds to the drive designated for the CD-ROM reader.)

| Error Message/Problem  | Solution   |
|--|--|
| AGRICULTURE DISPLAY PROGRAM  |  |
| "Proc MAIN36 [or FILES] line 242, open error<br>[letter]:AG82_02.DBF (4) Retry? (Y/N)" | Check the number of files that can be opened as stated in the CONFIG.SYS file. It should contain the line "files=20" (or higher).                    |
| "Proc MAIN36 line 15, open error<br>[letter]:AG82_DOC.DBF (2)<br>Retry? (Y/N)"         | Letter designation for CD-ROM drive is not consistent with the display program. Type "CDREADER" (no quotes) at the DOS prompt to change the program. |
| "Proc MAIN36 line 17, open error TAB36.DBF (2)<br>Retry? (Y/N)"                        | Missing file TAB36.DBF. Check the directory containing search soft-ware.   |
| "Proc ACHOICE, out of memory<br>Continue?"   | Display program needs more memory. If your system uses a memory resident program, restart system without activating memory resident program(s).      |



## Troubleshooting Guide, Cont.

### Error Message/Problem

### Solution

#### RETAIL DISPLAY PROGRAM

"File not found in module Retail at address 21D2:02E1 Hit any key to return to system"

Missing the two screen files, MENU.SCR and DATA.SCR. Check directory containing search software.

After displaying "One Moment..." on the menu screen, the data is never displayed and the computer "freezes up."

Letter designation for CD-ROM drive is not consistent with the display program. Type "CDREADER" (no quotes) at the DOS prompt to change the program.

If you're still having problems, please have the person who installed CD-ROM Extensions call the Census Bureau software specialists at (301) 763-4677.

## Who To Contact For Additional Information:

**Equipment:** For a general survey of about two dozen models of CD-ROM drives on the market (including prices and telephone numbers to call for more information), see the article about drives that appeared in CD-ROM Review in October 1987. It has been reprinted here on page 22, with the permission of the editors. For more specific information about issues such as compatibility, contact the distributor of the particular computer or CD-ROM drive that you are considering.

**CD-ROM Extensions:** If you're lucky, you'll receive a copy of CD-ROM Extensions with your CD-ROM drive, and someone with expertise in configuring systems will install it for you on your computer. If you want to learn more about CD-ROM Extensions and how it works, the description that begins on page 11 is a good place to start. For a more in-depth technical description, you may want to read an article entitled "Extending MS-DOS," that appeared in CD-ROM Review, v. 3, no. 2. Two other sources for information are CD-ROM equipment distributors and firms licensed by Microsoft to distribute single copies of CD-ROM Extensions. (See list of licensees provided on page 16.) Commercial CD-ROM publishers can also be very helpful.

**Census Test Disc No. 2 Software or Data Content:** If you have difficulty installing or using the retrieval software provided on the floppy disk, contact Census Bureau Customer Services at (301) 763-4100. This is also the number to call if you have any questions about the content of the CD-ROM or the accompanying documentation.

**Depository Resource Libraries:** Depository libraries with experience using Test Disc No. 2 may be a good source for information concerning use of the CD-ROM on a particular brand of equipment or in conjunction with other CD-ROM products. During the first phase of distribution, Test Disc No. 2 was distributed to 143 libraries across the country, including all regional depositories. For a list of these resource libraries, including information about the type of equipment they used (where available), see page 28.

**GPO Information Technology Program:** If you have a question about the GPO Information Technology Program or you're not sure who to ask about something else, call Jan Erickson at (202) 275-1003. We'll do our best to help you or refer you to someone else who can.

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## Readers Exchange

The University of Wyoming (UW) is a selective depository that volunteered to be one of the depository test sites that received Census Test Disc No. 2 in September 1988. To assist other depositories in the state when they received the disc, we put together a step-by-step guide on how to install the software.

This is what worked for the University of Wyoming CD configuration, consisting of:

Zenith microcomputer with 20MB hard drive and single floppy disk drive  
Hitachi CD-ROM drive, CDR 1503S  
MS-DOS CD ROM Extensions, Version 1.01  
MS-DOS Version 3.21  
Hewlett Packard Laser-Jet printer

1. From the root directory, create a subdirectory for the Census software:

```
C>md census [any word up to 8 characters can be used]
```

2. Load the software into the subdirectory named CENSUS:

```
C>cd\census [to change from the root directory to the Census subdirectory]
```

Insert the Census disk into a floppy drive, A in our case.

```
C>copy a:*. * [copies all files from the disk in drive A to the Census subdirectory on the hard disk]
```

3. Make sure the proper letter has been assigned to the CD-ROM drive. The Census software requires the drive to be designated as drive L. If another letter is used instead, you must change the Census software.

First, check your AUTOEXEC.BAT file in the root directory. In our configuration, the hard disk is the C drive, and the CD is the D drive. To determine which drive has been assigned to your CD, check the AUTOEXEC.BAT file, from the C> prompt:

```
C>type autoexec.bat
```

This will give you the contents of this file on the screen. For our equipment configuration, the AUTOEXEC.BAT file looks like this:

```
PATH=0:\BIN
\BIN\MSCDEX.EXE/D:MSCD000 /M:8
cls
```

On our system, we were already using the Silver Platter CD. When the system was first set up, the CD was assigned the letter D, which was the default for our equipment configuration.



We wanted the Silver Platter software and the Census software to use the same letter for the CD. Since Silver Platter was already using D for the CD, we decided to change the Census software so that it would also use D. To change the drive designated in the Census software, from the Census subdirectory (C>CENSUS), type:

```
C>cdreader
```

This brings up a screen with directions on renaming the CD drive. For our system, we changed it from L to D.

If the Census CD is the only CD product you are using, you can either change the Census software to use the default drive (D in our case) or you can change your AUTOEXEC.BAT file. To change the AUTOEXEC.BAT file, you need to use the EDLIN command. In the root directory type:

```
C>edlin autoexec.bat
```

EDLIN will display the message:

```
"End of input file
*"
```

Type: 2 [or whatever line names the Extensions program MSCDEX.EXE], ENTER (or RETURN). This brings up the line you wish to edit, followed by the same line number, where you will enter the new information:

```
2:*\BIN\MSCDEX.EXE /D:MSCD000 /M:8
2:*
```

At the asterisk, enter the new line, with the CD drive letter you are using:

```
2:*\BIN\MSCDEX.EXE /D:MSCD000 /M:8/L:L [ENTER]
*e [ENTER]
```

This ends your editing session. Do a control/alt/del to save your changes and bring you back to the root directory. To make sure your changes were done correctly, check your AUTOEXEC.BAT file again by entering:

```
C>type autoexec.bat
```

Submitted by: Carol Collier  
University of Wyoming Library

## Electronic Corner

### **Census Bureau announces CD-ROM products for the 1987 Censuses -**

A total of nine CD-ROMs will be produced for the 1987 Economic and Agriculture Censuses, according to officials from the Census Bureau. The first disc is slated for production in May; new discs will be produced approximately quarterly through early 1991. All of the discs will be made available to Federal depository libraries.

The 1987 Economic Census will be published on CD-ROM in two volumes. Volume I will be issued on six discs, as data becomes available. Each new disc will contain complete, cumulative information for the volume, thereby superceding earlier releases. For example, the first disc will contain selected states for the Geographic Area Series for the Census of Retail Trade; disc two of Volume I will contain all states for the Retail Trade Geographic Area Series. Volume II will provide zip code-level data for several of the Economic Censuses, as well as zip code-level data for the Census of Agriculture, on a single CD-ROM. Two additional discs containing county-level data and state-level data will be published for the Census of Agriculture.

Like Census Test Disc No. 2, basic search and retrieval software suitable for use on IBM-compatibles will be supplied with the CD-ROMs. The new discs, however, will require CD-ROM Extensions Version 2.0 (or higher). All files will be structured in dBase format to facilitate data manipulation and customized software development.

A new item number covering the entire set of discs will be established. A "survey with a sample" will be conducted after the first disc is produced. Selective depository libraries that wish to receive the remaining CD-ROMs in the series can do so by responding to the item survey.

Planning for CD-ROM products for the 1990 Decennial Census is continuing. Census Bureau officials expect to produce at least 20-30 discs, but that figure could go much higher. The discs are expected to be distributed to depository libraries.

### **New Census CD-ROM mailing list -**

To receive the latest news about forthcoming CD-ROM products, call the Census Bureau at (301) 763-4100. There is no cost for this service.

### **Commerce Department announces CD-ROM -**

Depository libraries can expect to receive CD-ROMs containing the National Trade Data Bank (NTDB) now being developed by the Commerce Department, according to our contacts there. The NTDB, mandated by the trade bill passed last summer, will provide "one-stop shopping" for economic and trade data generated by several agencies and used by government policymakers, businesses, and associations. In addition to the monthly CD-ROM product sent to depositories, Commerce will also offer a "premium" online service. Development is scheduled for completion in August 1990.

["Electronic Corner" is a new column which will appear as news develops regarding the electronic dissemination of information to depositories --Ed.]



## CD-ROM Extensions: A Layman's Description

The important thing to know about CD-ROM Extensions is that you will need it to use the Census disc, even if you are currently running other CD-ROM products without it. Some technical expertise may be required to install it, so you may want to seek help from someone who has experience in configuring systems and installing software. Finally, installation of CD-ROM Extensions may affect other CD-ROM applications that are already up and running on the same computer. What follows is a description of what CD-ROM Extensions is, how it works, and some observations about its implementation.

CD-ROM Extensions is a collection of programs that makes it possible for microcomputers using MS-DOS to communicate with CD-ROM drives. It was originally developed by Microsoft Corporation following agreement by major CD-ROM publishers and equipment manufacturers on the High Sierra format. The High Sierra format dictates a standard file structure for data on CD-ROMs. CD-ROM Extensions provides an interface between the retrieval software developed for a specific application and the MS-DOS operating system. CD-ROM Extensions eliminates the need for each CD-ROM publisher to write their own interface.

CD-ROM Extensions was originally written to support CD-ROMs produced in the High Sierra format. Adoption of ISO 9660 as the new international standard for CD-ROMs made it necessary for Microsoft Corporation to release a new version (2.0) of CD-ROM Extensions. Version 2.0 also supports "interleaving" of audio output with text and graphics. Census Test Disc No. 2 can be used with either version of Extensions, however, future discs from the Census Bureau will require version 2.0 or higher. (For more information about the difference between the two versions, contact Linda Mitchell at Microsoft Corporation on (206) 882-8230.)

CD-ROM Extensions has two components. One part is a hardware-dependent "device-driver" that actually translates signals between the microcomputer and the CD-ROM drive. This type of program is not unique to CD-ROM applications. Device drivers are necessary to control input and output to the computer for certain other kinds of peripherals, too, such as the screen or a mouse. Like other device drivers, the CD-ROM device driver must be named in the system file that the computer reads each time it is turned on to determine how the system is configured. This file is called config.sys.

The other program, called MSCDEX, allows the computer to read data from a CD-ROM drive just as though it was another magnetic disk. Ordinarily, MS-DOS limits the size of mass storage devices to 32 megabytes, but a CD-ROM may contain up to 550 megabytes or more. MSCDEX overcomes this limitation and creates a seamless interface between MS-DOS and the CD-ROM. MSCDEX is what is called a "terminate and stay resident" program. It must be run each time the system is turned on, and it remains in memory until the computer is turned off. The first thing MSCDEX does is search for the device driver program named in the config.sys file. Next, it assigns a drive letter to the CD-ROM drive and allocates memory buffers that will be used to temporarily store data as it is retrieved from the CD-ROM. Just before it terminates, the program tells DOS that drive D: is a network drive. Then MSCDEX remains inactive until MS-DOS sends a message to drive D. When that occurs, MSCDEX intercepts the message and determines whether it is really a request for access to the CD-ROM drive. If it is, the message is passed on to the CD-ROM device driver program. Otherwise, it is routed back to the MS-DOS network redirector.



The device driver program is termed "hardware-dependent" because each type of CD-ROM drive on the market requires a different driver program. For this reason, and to make CD-ROM Extensions as widely available as possible, Microsoft Corporation licensed a number of hardware suppliers to distribute CD-ROM Extensions with device drivers written for their particular equipment. If you purchase a new CD-ROM drive, you will probably receive a copy of CD-ROM Extensions with it. If you acquired a CD-ROM drive before the extensions were widely available (i.e., more than 9-12 months ago), you may have to purchase the software separately. (See page 16 for a list of companies licensed to sell single copies of CD-ROM Extensions.) If you purchase the extensions separately, be sure to select a company that offers a device driver program compatible with the brand of CD-ROM equipment that you have.

Although all versions of CD-ROM Extensions work basically the same way, installation procedures may vary slightly from one supplier to another. Many versions contain a program that will automatically install the software for you, after you have answered a few questions about the type of equipment that you plan to use. Be sure to follow the instructions for installing CD-ROM Extensions that are provided with the software.

The first step, if you are installing Extensions without the aid of an automatic set-up program, is usually installing the device driver program and MSCDEX.EXE on your bootable disk. For computers containing a hard drive, this usually means drive C. The name of the device driver program varies from one version of extensions to another; one common practice of software developers is to name it after the brand of CD-ROM drive that it supports, e.g., HITACHI.SYS. The device driver program and MSCDEX are frequently set up in separate subdirectories, however, this practice is not universal.

The next step is to add a line to the CONFIG.SYS file to identify the device driver program. This line typically looks something like this:

```
DEVICE=\path\driver name/D:\driver alias/N:#
```

For example: device=\dev\hitachi.sys/D:MSCD001/n:1

The driver name (e.g., hitachi.sys) and the driver alias should be provided by the set-up program or in the instructions that accompany the floppy disk containing the extensions software. The symbol # at the end of the line should be replaced with the number of CD-ROM drives (up to 4) that will be hooked up to the microcomputer.

The third step is to add a line to the AUTOEXEC.BAT file for running MSCDEX.EXE and assigning a letter to your CD-ROM drive. Depending on your system configuration, you may opt to set up one or more batch files to accomplish the same purpose. If you add a line to the AUTOEXEC.BAT file, it will probably look something like this:

```
\path\MSCDEX.EXE/D:driver alias/M:8/L:L
```

For example: \BIN\mscdex.exe/d:mscd001/m:12/L:L

The driver alias, which is really the name that your system will use to identify the device driver, should be the same one that is named in your CONFIG.SYS file. The number following M: is the number of memory buffers allocated (usually 8, but sometimes more). The last letter, following the L:, designates the letter assigned to the CD-ROM drive. If you use another letter besides "L" to identify your CD-ROM drive, then you must use the CDREADER program supplied on the floppy disk to change the Census software. (See the reading file contained on the floppy disk for more information.) Another option, if you are using other CD-ROMs that require the drive to be assigned a different letter, is to set up a separate batch file for each, instead of modifying the AUTOEXEC.BAT file.

Though the final step is simple, it's also easy to overlook. You must reboot the system in order to activate the changes that you've just made to your CONFIG.SYS and AUTOEXEC.BAT files.

Page 16 contains a list of the names and telephone numbers of the companies that sell single copies of CD-ROM Extensions without requiring purchase of a CD-ROM drive as well.

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# Microsoft® MS-DOS® CD-ROM Extensions: Version 2.0

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## *Product Overview*

CD-ROM (Compact Disc-Read Only Memory) is a revolutionary breakthrough in information distribution. It combines high storage capacity (660 megabytes) and low cost with convenience and durability. The potential of CD-ROM to vastly expand the capabilities of the personal computer is now a reality.

Microsoft MS-DOS CD-ROM Extensions were developed to standardize the interface between the personal computer and CD-ROM drives. The extensions make it possible for any personal computer running the MS-DOS operating system to read data from a CD-ROM disc pressed in the High Sierra format. With the extensions, MS-DOS views the compact disc as just another hard disk. The result is a seamless, transparent interface to the CD-ROM technology.

The extensions free CD-ROM application developers from the need to provide interface software for specific CD-ROM drives. The extensions are distributed with CD-ROM drives by drive manufacturers and marketers, who license them from Microsoft Corporation. Single end-user copies are available from the companies listed on the reverse.

The Extensions also allow a personal computer on a local area network (LAN) to access a CD-ROM server attached to the network. Each personal computer on the network must have the extensions installed in order to access the CD-ROM drive server. The server vendor must provide an installable driver that allows transparent access to the CD-ROM over the network.

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### **Highlights of New Features in Version 2.0**

- Version 2.0 reads discs pressed in the May 28, 1986 version of the High Sierra format and the new ISO 9660 version of the High Sierra format. This ability is transparent to the user.
- Version 2.0 provides Kanji (Japanese language) support in files and filenames.
- Version 2.0 provides extensive functional enhancements.
- Version 2.0 supports applications with full multimedia functionality, including interleaving of audio, text, images, graphics, and animation.

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### **High Sierra (ISO 9660) File Format**

The High Sierra (ISO 9660) logical file format allows CD-ROM discs to be created in a single format that can be read by a variety of computers running different operating systems and using different CD-ROM drives. The High Sierra format was first published on May 28, 1986. The International Standards Organization has issued a revised version of the High Sierra format as a world standard (ISO 9660). The High Sierra format is supported by major participants in the CD-ROM industry. MS-DOS CD-ROM Extensions version 2.0 reads discs pressed in either version of the High Sierra format.

Microsoft is committed to CD-ROM technology. As the force behind the MS-DOS operating system, we are in the best position to facilitate the integration of CD-ROM and MS-DOS, ensuring compatibility with present and future versions of the operating system.



## Technical Highlights

Microsoft MS-DOS CD-ROM Extensions consist of two software components: a hardware-independent program and a hardware-dependent device driver (specification and sample provided by Microsoft).

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### Hardware-independent Program

This program is a "terminate and stay resident" module and is installed with the MS-DOS AUTOEXEC.BAT file. It uses the Microsoft Networks interface to the MS-DOS operating system and therefore requires Microsoft MS-DOS version 3.1, 3.2, or 3.3. It overcomes the 32 MB disk size limitation of MS-DOS and allows the entire CD-ROM disc to be read like an ordinary magnetic disk. Individual files may be as large as desired up to the full size of the disc. Existing programs can access files on the CD-ROM disc as if it were an ordinary disk.

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### Hardware-dependent Device Driver

Each specific CD-ROM drive requires its own device driver. The driver implements basic functions to read the CD-ROM disc and is installed with the MS-DOS CONFIG.SYS file. A minimum set of these functions is required for the driver. Microsoft provides OEM customers with detailed specifications for the device driver as well as a sample driver. Drive manufacturers and marketers are responsible for providing the actual device driver.

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### For Developers of CD-ROM Applications

Microsoft MS-DOS CD-ROM Extensions make it possible for computers running the MS-DOS operating system to read CD-ROM discs pressed in the High Sierra (ISO 9660) format. The extensions are not required for application development.

Applications access the CD-ROM disc using standard MS-DOS OPEN and READ calls. Programmers can develop CD-ROM applications using standard MS-DOS tools. Developers only need the extensions to read and test their discs after pressing. As long as the High Sierra format is followed, CD-ROM applications can be developed without concern for device incompatibilities.

Microsoft licenses Microsoft MS-DOS CD-ROM Extensions to CD-ROM drive manufacturers and marketers, who include the extensions with their drives. There are numerous pre-mastering and mastering service companies that can assist developers in creating CD-ROM discs in the High Sierra (ISO 9660) format, either by providing these services or by licensing the necessary software to developers.

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## Licensees

The following CD-ROM drive manufacturers and marketers have licensed Microsoft MS-DOS CD-ROM Extensions: Denon, Hitachi, IOMEGA, Matsushita, Online, Philips, Reference Technology (RTI), Sanyo, Sony, Toshiba, and Yamaha.

If you already have a CD-ROM drive, you can license single copies of the extensions from these companies: Discovery (614-761-2000), Meridian Data (408-476-5858), OMI (408-395-4332), Online (301-428-3700), RTI (303-449-4157), and TMS (405-377-0880).

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## Sources For MS-DOS CD-ROM Extensions

The Microsoft MS-DOS CD ROM Extensions are supplied to end users through the manufacturers or marketers of CD-ROM drives. Contact the manufacturer or marketer of your CD-ROM drive to determine their availability for a particular CD-ROM drive.

In addition, the companies listed below are supplying the MS-DOS CD ROM Extensions for the CD-ROM drives indicated.

| Company   | Drives Supported  |
|---|---|
| <b>Nissei Sangyo America, LTD.</b><br>Attn: Mr. H. Nagao<br>1701 Golf Road<br>Suite 401<br>Rolling Meadows, IL 60008<br>312-981-8989                        | All Hitachi drives  |
| Distributor:<br><b>IVID Communications</b><br>Attn: Mr. Jack Spiegelburg<br>7030 Convoy Court<br>San Diego, CA 92111<br>619-576-0611                        | All Hitachi drives  |
| <b>Laser Magnetic Storage International (Philips)</b><br>Attn: Ms. Gloria Mitchell<br>4425 Arrowswest Drive<br>Colorado Springs, CO 80907<br>1-800-777-5674 | Philips (all models)  |
| <b>Toshiba America</b><br>Mr. Ron Haglund<br>9740 Irvine Blvd.<br>Irvine, CA 92718<br>714-583-3117  | XM-2000<br>XM-3000  |
| <b>Online Computer Systems</b><br>Attn: Ms. Cheryl McGarry<br>25251 Century Blvd.<br>Germantown, MD 20874<br>301-428-3700                                   | Hitachi CDR-1502S<br>Hitachi CDR-2500S<br>Hitachi CDR-1503S<br>Philips<br>Sony (all models) |

**Company****Drives Supported****Reference Technology**

Attn: Ms. Donna Pyle  
 5700 Flatiron Parkway  
 Boulder, CO 80301  
 303-449-4157

Hitachi CDR-1502S

Hitachi CDR-1503

Philips CM-100,153

Sony (all models)

**Meridian Data**

Attn: Ms. Trish Shaw  
 Capitola Rd. Suite 101  
 Capitola, CA 95010  
 408-476-5858

Amdek, Denon, DEC

Hitachi, Ref. Tech LMSI / Philips

Sony, Sanyo

Toshiba & others

**Discovery Systems**

Attn: Jack Ryan or Amy Fetting  
 7001 Discovery Blvd.  
 Dublin, OH 43017  
 614-761-2000

Hitachi CDR-1502S

Hitachi CDR-1503

Sony CDU-100

Philips CM-100

**TMS, Inc.**

Attn: Ms. Jana Stone  
 P.O. Box 1358  
 Stillwater, OK 74076  
 405-377-0880

Denon, Hitachi

Philips, Sony

Toshiba

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# CD-ROM

## MARKET DRIVEN

*"We entered the market because there were no standards, and it was the correct time to go retail. The phone call rate and interest level has jumped 100 fold since Comdex."*

**—David Dahlberg, Marketing Manager for systems & CD-ROM, Amdek**

**I**f you want to use a CD-ROM, you have to have a drive. The following pages describe the CD-ROM drives currently available. Although the technical specifications for CD-ROM are set down in the Philips/Sony Yellow Book standard, there are significant variations in CD-ROM drives in the areas of price, appearance, and features. Recent months have seen development of half-height built-in drives, designed to fit in newer IBM PCs and compatibles. Audio capabilities are starting to be seen. Some manufacturers will tout a quicker access time.

CD-ROM drives are still difficult to buy. Not all companies will sell a single drive to an individual user. To date, only Amdek has announced a full-fledged retail effort, selling its re-packaged Hitachi drive with Microsoft Bookshelf when this CD-ROM becomes available. Many publishers of higher-priced CD-ROMs include a drive with their discs.

Interviews with executives of CD-ROM drive manufacturers were conducted for this survey. Some of their opinions are in agreement, some are contradictory, and some are flatly surprising.

Look over the following pages, use the address and reader service resources provided, and find out what drive is best suited for your needs.

The drives pictured on the cover and at right are, clockwise from lower left, the Toshiba XM-2000A and Sony CDU-5002, JVC XR-R1000, Philips/LMSI CM100, Sanyo ROM-2500, DEC RRD50-QA, Denon DRD-550 and DRD-250, Sony CDU-5002, and Hitachi CDR-1503S.

**by Janet Tiampo**

# VES





## AMDEK

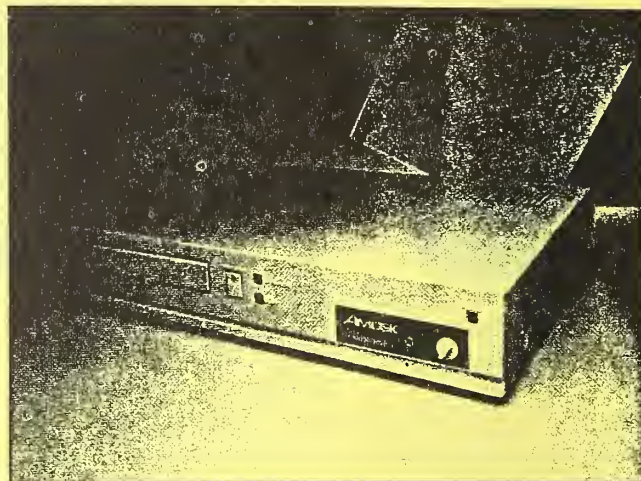
1901 Zanker Road  
San Jose, CA 95112, (408) 436-8570  
Circle 86 on Reader Service Card

**Laserdrive 1 (Hitachi 1503S) .....\$999**  
14.56" x 3" x 13.38"; Stand-alone front-loading; IBM PC/XT/AT CD-A interfaces

*"We work closely with suppliers in Japan to get the price down. (But) CD-ROM drives are different from the audio drives. A lot of people compare audio drives to those for computers. The tolerance and quality level is different."*

*"I do see a potential for half-heights. (But I) see a problem with half-heights fitting into a PS/2. For old classic PCs, yes, there may be an opportunity."*

—David Dahiberg, marketing manager for systems & CD-ROM, Amdek



**Amdek: Laserdrive 1**

## DEC

2 Mount Royal Ave.  
Marlboro, MA 01752, (617) 480-4820  
Circle 88 on Reader Service Card

(Philips/LMSI CM100 series)

**RRD50-QA .....\$1,200**  
12.63" x 4.56" x 10.5"; Stand-alone top-loading; MicroVax II interface

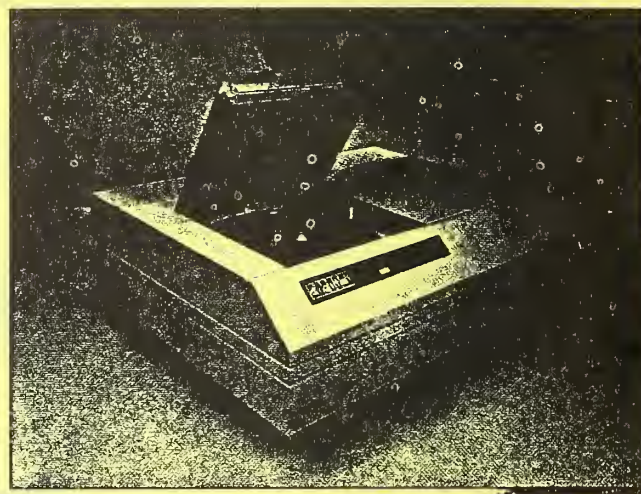
**RRD50-EA .....\$1,200**  
12.63" x 4.56" x 10.5"; Stand-alone top-loading; VAXmate, IBM PC/XT/AT interfaces

**RRD50-AA .....\$1,000**  
12.63" x 4.56" x 10.5"; Stand-alone top-loading; For use with two-disc system only

*"Retail is not a particular element of (DEC's) strategy... (and) we're not aggressively broadcasting price reduction. Our customers would rather pay for better performance. This is especially true in a shared network environment where performance is important."*

*"Until CD-ROM is a ubiquitous technology, when it's sold with every computer, the half-height issue won't arise as a major factor."*

—Ed Schmid, manager of departmental publishing systems, DEC



**DEC: RRD50-QA**

## DENON

27 Law Drive  
Fairfield, NJ 07006, (201) 575-7810  
Circle 87 on Reader Service Card

**DRD-550 ..... OEM pricing**  
5.75" x 3.75" x 8"; Stand-alone front-loading, or built-in; SCSI, Custom or CD-Audio (CD-A) interface

**DRD-250 ..... OEM pricing**  
5.88" x 1.75" x 8"; Built-in half-height; IBM PC/XT/AT interface

**DRD-251 ..... OEM pricing**  
5.88" x 1.75" x 8"; Built-in half-height; SCSI interface

*"Denon would be glad to go retail as soon as we see a need to. For me it's a launch into a whole category that we're not in. I don't see the software that is needed to do it. We have to see software that the retail market wants. (But) that's out of our control. There will no doubt be a major change in price when real production can be realized. Right now we fix a price based on trying to get a sale made rather than on any reality. It has no relationship to what the drive costs us."*

—Robert Heiblim, senior vice president, Denon



**Denon: DRD-550, DRD-250**



## HITACHI

401 West Artesia Blvd.  
Compton, CA 90220, (213) 537-8383  
Circle 89 on Reader Service Card

**CDR-1502S** .....\$899  
17.12" x 3.35" x 11.38"; Stand-alone front-loading; IBM PC/XT/AT, eight-bit parallel interfaces

**CDR-2500** .....\$899  
6" x 3.25" x 8.38"; Built-in; IBM PC/XT/AT, eight-bit parallel interfaces

**CDR-1503S** .....\$884  
14.56" x 3" x 13.38"; Stand-alone front-loading; IBM PC/XT/AT, CD-A interfaces

**CDR-1553S** .....\$1,199  
Not yet available; Stand-alone front-loading; SCSI, CD-A interfaces

*"We'll see a much bigger demand in retail sales, but (only when) the software becomes available."*

*"It's difficult to say if prices will fall. There will be some degradation of prices but not in the same way as CD-Audio."*

*"Half-heights will be a complement, another option. Technology lends itself to more compact size. For a single CPU, it's an additional option. . . (half-heights) will help CD-ROM penetration but not degrade full-size (sales)."*

—Eric Kamayatsu, national sales manager, Hitachi

## JVC

41 Slater Drive  
Elmwood Park, NJ 07407, (201) 794-3900  
Circle 90 on Reader Service Card

**XR-R100** .....\$1,500  
9.06" x 2.75" x 13"; Stand-alone front-loading; SCSI interface

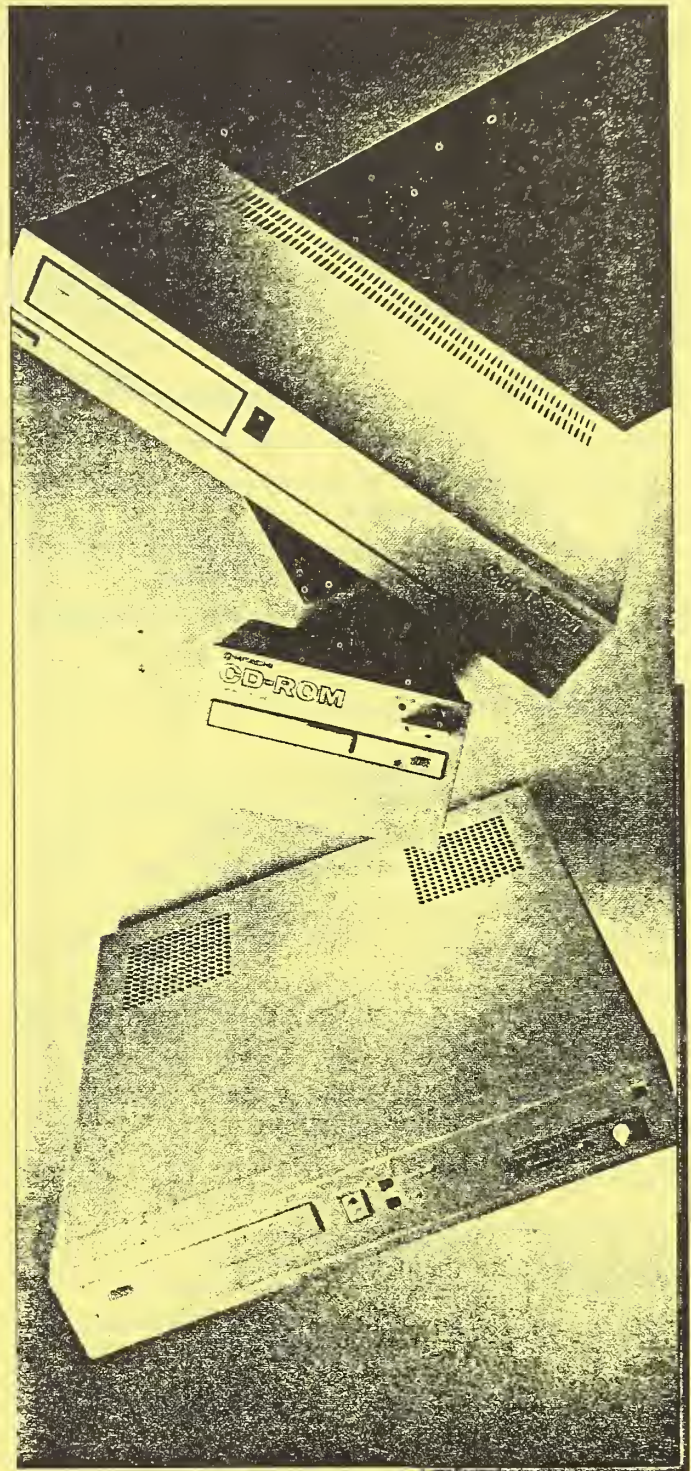
**XR-R1001** .....\$1,000  
5.75" x 1.63" x 8.06"; Built-in half-height; SCSI interface

*"Until the market really develops as a retail market, we will stay with the OEM market. In a way (CD-ROM today) is like CD-Audio; three years ago, you'd go into a record store and find about five titles."*

*"There will be an awful lot of price pressure very quickly on CD-ROM drives. People are asking, 'why should I have to pay two or three times the price for something that retrieves in almost the same way as CD-Audio?'"*

*"Our biggest request is for half-heights, which is a bit surprising. We were expecting a slow and gradual build-up with the half-heights."*

—John Harris, manager, business development, JVC



Hitachi: CDR-1502S, CDR-2500, CDR-1503S



## LMSI/PHILIPS

4425 ArrowsWest Drive  
Colorado Springs, CO 80907, (303) 593-4269  
Circle 91 on Reader Service Card

**CM100** ..... \$1,050  
12.63" x 4.56" x 10.5"; Stand-alone top-loading, IBM PC/XT/AT, Apple IIe interfaces

**CM110** ..... \$1,350  
12.63" x 4.56" x 10.5"; Stand-alone top-loading, SCSI interface

**CM201** ..... OEM pricing  
5.75" x 1.63" x 8.13"; Built-in half-height; IBM PC/XT/AT, Apple IIe interfaces

**CM210** ..... OEM pricing  
5.75" x 2.25" x 8.13"; Built-in half-height; SCSI interface

*"Retail is in LMSI's strategy. By 1988, we will have drives in retail outlets."*

*"Half-heights are critical. We've learned from previous drives, and now can make half-heights available at lower prices."*

*"Prices will go down. There are economies of scales in manufacturing. We've had to go up a learning curve and a lot of that is now behind us."*

—Joe Tripoli, vice president, marketing, LMSI

## LODOWN

10 Victor Square, Suite 600  
Scotts Valley, CA 95066, (408) 438-7400  
Circle 92 on Reader Service Card

**LD CD-ROM Drive (Toshiba XM-2000A)** ..... \$1,595  
6" x 3.38" x 13.75"; Stand-alone front-loading; SCSI, CD-A interfaces

*"It's the publishing of data, not the dropping of prices that will increase sales. It's stupid to (drop prices) now... it's absolutely stupid. Even if we gave them away today, people wouldn't take them."*

*"We're only doing Macintosh applications. We will come out very soon with a product that will compete (with Amdek) on the Mac side. Amdek has actually helped us."*

—Bob Lindgren, CEO, vice president sales & marketing, LoDown

## PANASONIC

1 Panasonic Way  
Secaucus, NJ 07094, (201) 392-4602  
Circle 93 on Reader Service Card

**SQ-D1** ..... \$1,495, \$1,695 with SCSI  
5.75" x 1.63" x 8"; Built-in half-height; IBM PC/XT/AT, SCSI interfaces

**SQ-D101** ..... \$1,695, \$1,895 with SCSI  
6.06" x 3.78" x 13.38"; Stand-alone front-loading; IBM PC/XT/AT, SCSI interfaces

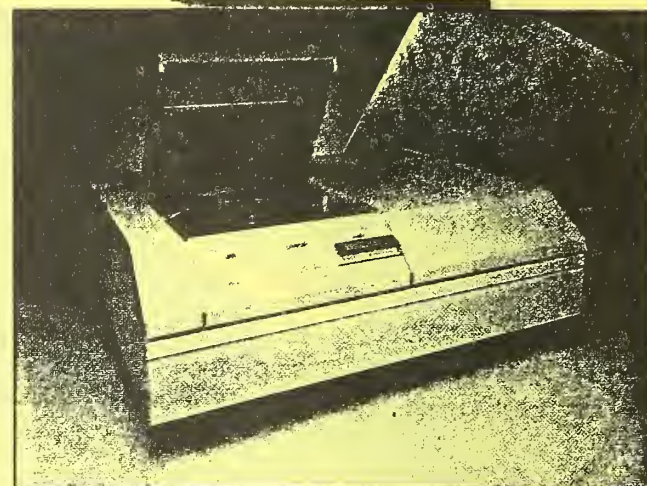
*"I would expect that if all goes according to plan, (going retail) should happen this year (for Panasonic). The only contingency is whether content in over-the-counter discs are available and the number of drives sold."*

*"I foresee the half-height as being a better seller than the stand-alone."*

—Joe Videtti, national marketing manager, optical discs, Panasonic



**JVC: XR-R100**

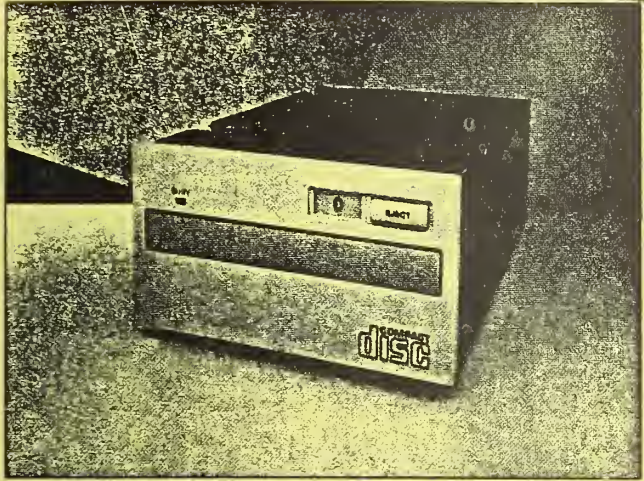


**LMSI/Philips: CM 100**

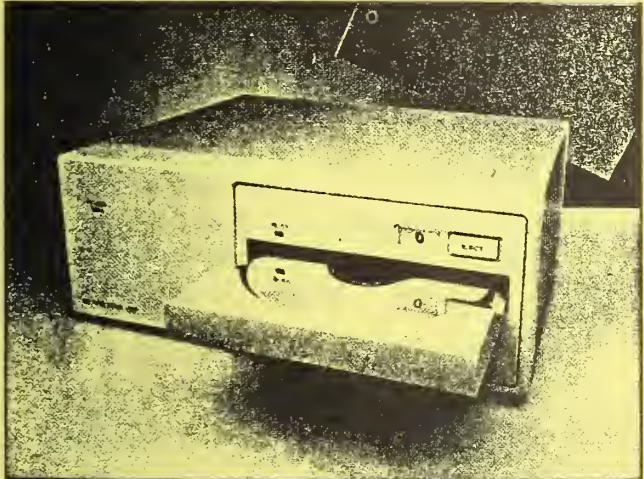


**Sanyo: ROM-2500**





Sony: CDU-100



Sony: CDU-5002



Toshiba: XM-2000A

## REFERENCE TECHNOLOGY

5700 Flatiron Parkway  
Boulder, CO 80301, (303) 449-4157  
Circle 94 on Reader Service Card

Four drives offered under Clasix 500 series:  
Hitachi 1502S; Sony CDU-100, CDU-5002; Philips/LMSI CM100  
All priced at \$990

*"(Amdek's move to retail) doesn't change our strategy. . . . when the industry moves from selling handfuls of drives to selling thousands of drives, the prices will drop. One issue is cartridge standardization, and with the PS/2 there is a new form factor to consider."*

—Mike Befeier, vice president of strategic marketing, Reference Technology

## SANYO

200 Riser Road  
Little Ferry, NJ 07643, (201) 440-9300  
Circle 95 on Reader Service Card

ROM-2500 . . . . . OEM pricing  
5.75" × 1.63" × 8"; Built-in half-height; IBM PC/XT/AT, SCSI interfaces

ROM-300 . . . . . OEM pricing  
5.75" × 1.63" × 8"; Stand-alone front-loading; IBM PC/XT/AT, SCSI interfaces

*"This fall, we may go retail, but the final decision has not been made yet. Because of currency problems, I don't think the price will drop sharply. The half-height is like a floppy drive, convenient for users."*

—Kaz Kabota, chief engineer, Sanyo

## SONY

655 River Oaks Parkway  
San Jose, CA 95134, (408) 432-0190  
Circle 96 on Reader Service Card

CDU-100 . . . . . \$690  
10.5" × 4.25" × 8.75"; Stand-alone front-loading; Sony Bus

CDU-5002 . . . . . \$590  
5.75" × 3.25" × 8"; Built-in; Sony Bus

*"Until people see big companies like IBM adopting CD-ROM, the technology will not take. . . this is the confidence factor. Sony's strategy is to drop the price to sell drives. Half-height is important because space is valuable in all systems."*

—Olaf Olafsson, market manager, Sony

## TOSHIBA

9740 Irvine Blvd.  
Irvine, CA 92680, (714) 583-3117  
Circle 97 on Reader Service Card

XM-2000A . . . . . OEM pricing  
6" × 3.38" × 13.75"; Stand-alone front-loading; SCSI, CD-A interfaces

XM-2000B . . . . . OEM pricing  
5.75" × 3.25" × 8"; Built-in; SCSI, CD-A interfaces

*"Toshiba will still target OEMs. Half-heights. . . will make the industry (and) the cartridge units will be the most successful. It's very likely that the de facto Sony standard will take over."*

—Dr. R.E. Haglund, director of marketing for optical products, Toshiba

## Depository Resource Libraries

In September 1988, copies of Census Test Disc No. 2 were distributed to 90 selective depositories and all 53 regionals. One of the reasons for the phased distribution was to create a network of depository librarians who could share their experiences in using the CD-ROM. The list below contains the names and points of contact for libraries that participated in the field test, excluding a few that reported equipment or other limitations.

### Contact Person/Address

### Microcomputer/ CD ROM Drive

#### Alabama

# 0002

Mr. Harmon Straiton  
Auburn University Libraries  
Microforms and Documents Dept.  
Auburn, AL 36849-5606  
(205) 826-4500

IBM  
Philips

# 0008B (Regional)

Ms. Betty J. Tims  
Auburn University at Montgomery  
Library  
Montgomery, AL 36193  
(205) 244-9211

# 0012 (Regional)

Ms. Sarah Reeves  
Univ. of Alabama  
Documents/Main Library  
Box 870266  
Tuscaloosa, AL 35487-0266  
(205) 348-1487

IBM PS/2 Model 30  
Philips CM100

#### Alaska

# 0016

Mr. Louis Coatney  
Alaska State Library  
Attn: Federal Documents Dept.  
P.O. Box G  
Juneau, AK 99811-0571  
(907) 465-2927

Amdex  
Hitachi

Contact Person/AddressMicrocomputer/  
CD ROM DriveArizona

# 0022 (Regional)  
 Ms. Janet Fisher  
 Dept. of Library, Archives, and Public Records  
 State Capital, 3rd Floor  
 Phoenix, AZ 85007  
 (602) 542-4121

# 0025  
 Ms. Becky Burke  
 Arizona State Univ.  
 Hayden Library, Govt. Documents Service  
 Tempe, AZ 85287  
 (602) 965-3387

IBM PC-XT  
 Philips-CU153

Arkansas

# 0036B (Regional)  
 Ms. Mary L. Honeycutt  
 Arkansas State Library, Documents Service  
 One Capital Mall  
 Little Rock, AR 72201  
 (501) 682-2864

Zenith  
 Hitachi

California

# 0045B  
 Mr. Bill Jones  
 California State Univ. at Chico Library  
 Govt. Publications and Maps Dept.  
 Chico, CA 95929  
 (916) 895-6802

# 0045A  
 Ms. Patricia Inouye  
 Univ. of California at Davis  
 Peter Shields Library, Govt. Documents Dept.  
 Davis, CA 95616  
 (916) 752-1624

IBM PC-XT  
 Philips CM100



Contact Person/Address

California, Cont.

# 0065A

Ms. Debora Richey  
California State Univ. at Fullerton Library  
P.O. Box 4150  
Fullerton, CA 92634  
(714) 773-2633

# 0061A

Ms. Alice Littlejohn  
California State Univ. at Long Beach Library  
1250 Bellflower Blvd.  
Long Beach, CA 90840  
(213) 985-8880

# 0043

Ms. Barbara Silvernail  
Univ. of California at Los Angeles  
Univ. Research Library, Public Affairs Service  
405 Hilgard Ave.  
Los Angeles, CA 90024  
(213) 825-1088

# 0065B

Ms. Margaret Mooney  
Univ. of California at Riverside  
Govt. Publications Dept.  
900 University Ave.  
P.O. Box 5900  
Riverside, CA 92517  
(714) 787-3714

# 0040 (Regional)

Mr. Tom Anderson  
California State Library, Govt. Publications Section  
P.O. Box 94237  
Sacramento, CA 94237-0001  
(916) 324-4863

Microcomputer/  
CD ROM Drive

IBM compatible  
Philips CM100

IBM PC-XT  
Hitachi 1503S

Compuadd Standard 286  
Philips CM121

IBM PC  
Philips CM121

Contact Person/Address/California, Cont.

# 0066A

Mr. Chuck Dintrone  
 San Diego State Univ. Library, Govt. Publications  
 Dept.  
 San Diego, CA 92182-0511  
 (619) 265-4303

# 0044

Ms. Lavonne Jacobsen  
 San Francisco State University  
 J. Paul Leonard Library, Govt. Publication Services  
 1630 Holloway Ave.  
 San Francisco, CA 94132  
 (415) 469-2732

# 0051

Ms. Joan Loftus  
 Stanford Univ. Libraries, Jonsson Library of Govt.  
 Docs.  
 Stanford, CA 94305  
 (415) 723-2727

Microcomputer/  
CD-ROM Drive

AST 286 Model 120  
 LMSI Model CM132

Colorado

# 0069 (Regional)

Mr. Tim Byrne  
 Univ. of Colorado at Boulder  
 Govt. Publications Library, Campus Box 184  
 Boulder, CO 80309-0184  
 (303) 492-8834

# 0071 (Regional)

Mr. Michael Espinosa  
 Denver Public Library  
 Business Science and Govt. Publications Dept.  
 1357 Broadway  
 Denver, CO 80203  
 303) 571-2135

Contact Person/Address

Colorado, Cont.

# 0068

Mr. Fred Schmidt  
Colorado State University, Govt. Documents Dept.  
Fort Collins, CO 80523  
(303) 491-1881

Microcomputer/CD-ROM  
Drive

NCR PC-6  
Philips 201/Internal Drive

Connecticut

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Hartford, CT 06106  
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Hitachi

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P.O. Box 2491 Yale Station  
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Storrs, CT 06268  
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American University - Washington College of Law  
Library  
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Washington, DC 20016  
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IBM PC-AT  
Philips CM100



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# 0107B

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Boca Raton, FL 33431  
(407) 393-3788 or (407) 343-3762

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P.O. Box 248214  
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(305) 284-3155

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100 S. Andrews Ave.  
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Library West - Documents Dept.  
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Govt. Documents and Maps  
Atlanta, GA 30332  
(404) 894-4519

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Ms. Erma Banks, Columbus College Library  
Columbus, GA 31993  
(404) 687-5944

Microcomputer/CD-ROM  
Drive

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Hitachi CDR 1503S

Comtext X7  
Amdex LS/2

NCR  
Sony CDU-5002B

Zenith 159  
Amdek Laser Drive 1

Zenith-Model ZF-151-52  
Digital CD Reader RRD50

Zenith ZCM-1390  
Hitachi CDR-1503S

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Edwardsville, IL 62026  
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Springfield, IL 62756

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(502) 384-2126

IBM PC-AT  
Hitachi

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IBM PS/2 Model 30  
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Microcomputer/  
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IBM PC-AT  
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IBM PS/2 Model 30  
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 Houghton, MI 49931  
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 Minneapolis, MN 55455  
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Microcomputer/  
CD ROM Drive

IBM PC-XT  
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Epson Equity I+  
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Turbo IBM/AT Compatible  
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Microcomputer/  
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Microcomputer/  
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Hanover, NH 03755  
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Leading Edge Model D  
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CD ROM DriveNew Mexico

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Microcomputer/  
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New York, NY 10027

IBM PC-XT  
Reference Tech. Inc.

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2000



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 Library - Documents Office  
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Contact Person/Address

Microcomputer/  
CD ROM Drive

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Cincinnati, OH 45221-0033  
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Philips CM100

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workstation  
Hitachi

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Hitachi CDR-1502S

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IBM PS  
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Oregon

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IBM PC-XT  
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IBM 3270  
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Microcomputer/  
CD ROM Drive

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Warren, PA 16365  
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Columbia, SC 29208  
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South Dakota

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800 Governors Dr.  
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VSS  
Hitachi 3000

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CD ROM DriveSouth Dakota, Cont.

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 Mikkelsen Library - Public Service  
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IBM PC 5150  
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Tennessee

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 Vanderbilt Univ. Library - Central Documents Unit  
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Zenith Z-248  
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 Austin, TX 78712  
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Contact Person/Address

Microcomputer/  
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Denton, TX 76203  
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Standard 286  
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Philips CM121

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Hitachi (double drive)

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Sony CDU 100B

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Hitachi 1503S

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CD-ROM DriveWisconsin

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# 0664  
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Madison, WI 53706  
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Philips

Zenith 258  
Hitachi 1502S

Wyoming

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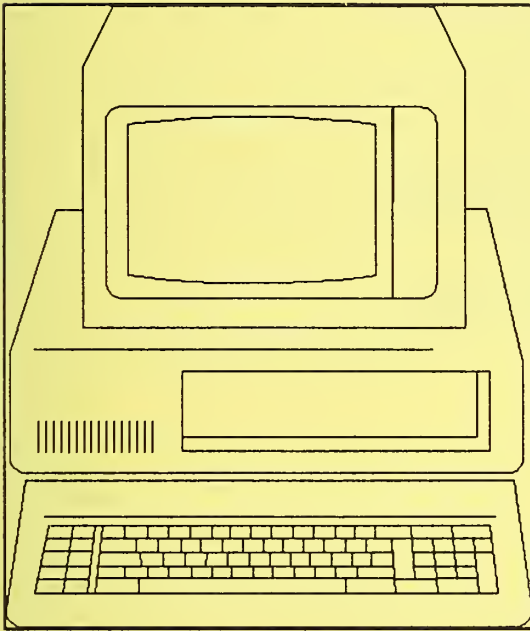
WYSE  
Sony

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University Station  
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Hitachi CDR-1503S

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